

**What is Claimed is:**

1. An amplifier circuit, for providing noiseless amplification of an input signal having a carrier, comprising:

- a primary amplifier having an input for  
5 receiving said input signal and an output for providing an amplified output signal,  
a first circuit means, connected to said input and said output, for isolating amplifier generated noise,  
a second circuit means, connected to said first  
10 circuit means and to said output, for superpositioning said amplifier generated noise onto said output signal to cancel said amplifier generated noise from said output signal, and  
a third circuit means, connected to said input  
15 and to said first circuit means, for mixing said input signal and amplifier generated noise to produce a first control signal, and modulating one of said input signal and said output signal in response to said first control signal.

2. The amplifier circuit as set forth in Claim 1 wherein said first circuit means includes a first modulator connected to said input, a second modulator connected to said output, a first combiner connected to  
5 said first and second modulators and an error amplifier connected to said first combiner,

- whereby said first and second modulators receive and modulate said input and output signals, respectively, to match the amplitude and shift the phase  
10 by 180 degrees of said input and output signals, and said first combiner combines said input and output signals to isolate said amplifier generated noise.

3. The amplifier circuit as set forth in Claim 2 wherein said first modulator includes a variable delay, said second modulator includes a variable attenuator, and one of said first and second modulators includes a  
5 variable phase shifter.

4. The amplifier circuit as set forth in Claim 3 including a first control having a detector connected to said error amplifier, a loop filter connected to said detector and to one of said first and second modulators,  
5 whereby said first control controls said one of said first and second modulators and thereby keeps amplitude and phase balanced at said first combiner.

5. The amplifier circuit as set forth in Claim 1 wherein said second circuit means includes a third modulator connected to said first circuit means, a fourth modulator connected to said output, and a second combiner  
5 connected to said third and fourth modulators,  
whereby said third and fourth modulators receive and modulate said amplifier generated noise and said output signal, respectively, to match the amplitude and shift the phase by 180 degrees of said amplifier  
10 generated noise and said output signal, and said second combiner combines said amplifier generated noise and said output signal to cancel said amplifier generated noise from said output signal.

6. The amplifier circuit as set forth in Claim 5 wherein third modulator includes a variable attenuator, said fourth modulator includes a variable delay, and one of said third and fourth modulators includes a variable  
5 phase shifter.

7. The amplifier circuit as set forth in Claim 6 including a second control having a detector connected to said second combiner, a loop filter connected to said detector and to one of said third and fourth modulators,

5               whereby said second control controls said one  
of said third and fourth modulators and thereby keeps  
amplitude and phase balanced at said second combiner.

8. The amplifier circuit as set forth in Claim  
1 wherein said third circuit means includes a fifth  
modulator, a sixth modulator connected to said input for  
receiving said input signal, a detector connected to said  
5 fifth modulator and to said first circuit means, a loop  
filter connected to said detector and to said fifth  
modulator, said detector receiving said input signal from  
said fifth modulator and said amplifier generated noise  
from said first circuit means, using said input signal as  
10 a reference, downconverting said amplifier generated  
noise to around a frequency other than the frequency of  
said carrier, and separating amplitude fluctuations from  
phase fluctuations, and therefrom generating a control  
signal, and said fifth modulator receiving said input  
15 signal and said control signal, modulating said input  
signal in response to said control signal and  
transmitting said input signal to said primary amplifier.

9. The amplifier circuit as set forth in Claim  
8 wherein said fifth modulator includes a variable phase  
shifter and a variable attenuator, and said sixth  
modulator includes a variable delay and a variable  
5 attenuator.

10. An amplifier circuit, for providing  
noiseless amplification of an input signal having a  
carrier, comprising:

5               a primary amplifier having an input for  
receiving said input signal and an output for providing  
an amplified output signal,

              a first circuit having a first modulator with a  
variable delay connected to said input, a second  
modulator with a variable phase shifter and a variable

10 attenuator connected to said output, a first combiner for  
combining said input signal from said first modulator and  
said output signal from said second modulator and  
isolating thereby amplifier generated noise, and an error  
amplifier for receiving said amplifier generated noise  
15 from said first combiner and amplifying said amplifier  
generated noise,

a second circuit having third modulator with a  
variable delay connected to said output, a fourth  
modulator with a variable phase shifter and a variable  
20 attenuator connected to said error amplifier, and a  
second combiner configure to receive said output signal  
from said third modulator, to receive said amplifier  
generated noise from said fourth modulator, and to  
superposition said output signal and said amplifier  
25 generated noise to cancel said amplifier generated noise  
from said output signal, and

a third circuit having a fifth modulator with a  
variable phase shifter and a variable attenuator, a sixth  
modulator with a variable delay and a variable attenuator  
30 and connected to said input for receiving said input  
signal, a first detector connected to said fifth  
modulator and to said error amplifier, a loop filter  
connected to said first detector and to said fifth  
modulator, said first detector for receiving said input  
35 signal from said fifth modulator and said amplifier  
generated noise from said error amplifier, using said  
input signal as a reference to downconvert said amplifier  
generated noise to around a frequency other than the  
frequency of said carrier, and separating amplitude  
40 fluctuations from phase fluctuations, and therefrom to  
generating a first control signal, and said fifth  
modulator for receiving said input signal and said first  
control signal, modulating said input signal in response

to said first control signal and transmitting said input  
45 signal to said primary amplifier.

11. The amplifier circuit as set forth in Claim  
10 including a first control having a second detector  
connected to said error amplifier, a second loop filter  
connected to said second detector and to said first  
5 modulator,

whereby said first control controls said first  
modulator to keep amplitude and phase balanced at said  
first combiner.

12. The amplifier circuit as set forth in Claim  
11 including a second control having a third detector  
connected to said second combiner, a third loop filter  
connected to said third detector and to said third  
5 modulator,

whereby said second control controls said third  
modulator to keep amplitude and phase balanced at said  
second combiner.

13. An oscillator circuit comprising:  
a resonator,  
a phase modulator connected to said resonator,  
an amplifier circuit connected to said  
5 resonator and said phase modulator, for providing  
noiseless amplification of an input signal having a  
carrier, said amplifier circuit including:

a primary amplifier having an input for  
receiving said input signal and an output for  
10 providing an amplified output signal,

a first circuit means, connected to said  
input and said output, for isolating amplifier  
generated noise,

a second circuit means, connected to said  
15 first circuit means and to said output, for  
superpositioning said amplifier generated noise onto

said output signal to cancel said amplifier generated noise from said output signal, and

20           a third circuit means, connected to said input and to said first circuit means, for mixing said input signal and amplifier generated noise to produce a first control signal, and modulating one of said input signal and said output signal in response to said first control signal.

14. A mixer circuit comprising:

first and second amplifier circuits, each for providing noiseless amplification of an input signal having a carrier and each including:

5           a primary amplifier having an input for receiving said input signal and an output for providing an amplified output signal,  
          a first circuit means, connected to said input and said output, for isolating amplifier  
10           generated noise,  
          a second circuit means, connected to said first circuit means and to said output, for superpositioning said amplifier generated noise onto said output signal to cancel said amplifier  
15           generated noise from said output signal, and  
          a third circuit means, connected to said input and to said first circuit means, for mixing said input signal and amplifier generated noise to produce a first control signal, and modulating one  
20           of said input signal and said output signal in response to said first control signal, and  
          a frequency mixer connected to said first and second amplifier circuits and configured to receive and mix said output signals from said first and second  
25           amplifier circuits.